WHAT IS CLAIMED IS:

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1. An ink-jet recording device comprising an ink-jet recording head provided to a carriage, and ink supply means mounted to said carriage for supplying ink to said recording head, wherein:

said ink supply means is constructed as a differential pressure valve including a coil spring and a movable membrane normally contacted elastically with a valve seat by said coil spring.

2. An ink-jet recording device according to Claim 1, wherein:

said ink supply means is built in a container mountable to said carriage and provided with an ink storage area.

3. An ink-jet recording device according to Claim 1, wherein:

said movable membrane is arranged in parallel to a plane perpendicular to a direction in which said carriage is moved.

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4. An ink-jet recording device according to Claim 2, wherein:

said movable membrane is arranged in parallel to a plane perpendicular to a direction in which said carriage is moved; and

a plurality of said containers are mounted to said carriage and arranged adjacent to one another in the direction in which said carriage is moved.

5. An ink-jet recording device according to Claim 1, wherein:

said movable membrane is arranged in parallel to a vertical plane parallel to a direction in which said carriage is moved.

6. An ink-jet recording device according to Claim 2, wherein:

a main tank is installed on a body side of the casing; and

ink is supplied to said container via a conduit.

7. An ink-jet recording device according to Claim 1, wherein:

a main tank is mountable to said carriage, and adapted to be attached to and detached from said ink supply means.

8. An ink-jet recording device according to Claim 1, wherein:

a main tank is provided with a connection port; and

said container is provided with a hollow member insertable into said connection port with a fluid-tight state maintained.

9. An ink-jet recording device according to Claim 8, wherein:

said connection port is provided with valve means for normally sealing said connection port by a spring, and opening

said connection port upon insertion of said hollow member.

10. An ink-jet recording device according to Claim 7 or 8, wherein:

said main tank is divided into plural chambers by a partition or partitions, each provided with a communicating hole in a lower part thereof.

11. An ink-jet recording device according to Claim 2, wherein:

said container is provided with an ink injection port; and

ink supplementing means is provided within an range where said carriage is moved and in a non-printing area, said ink supplementing means being detachably contacted with said ink injection port for injecting ink.

12. An ink supply unit, wherein:

a differential pressure valve including a coil spring and a movable membrane normally contacted elastically with a valve seat by said coil spring is accommodated in a container having an ink storage chamber communicating with an ink supply port adapted to be connected to an ink-jet recording head.

13. An ink supply unit according to Claim 12, wherein:

said movable membrane is arranged vertically when said ink supply unit is mounted to a carriage.

14. An ink supply unit according to Claim 13, wherein:

said movable membrane is arranged in parallel to a plane perpendicular to a direction in which said carriage is moved.

15. An ink supply unit according to Claim 13, wherein:

said movable membrane is arranged in parallel to a direction in which said carriage is moved and in parallel to a vertical plane.

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16. An ink supply unit according to Claim 12, wherein:

said differential pressure valve includes a disc-like elastic membrane member formed at its center with an ink flow port, a valve seat located in an upstream side of ink flow and facing said ink flow port, and a coil spring located in a downstream side and pressing said ink flow port of said elastic membrane member onto said valve seat.

17. An ink supply unit according to Claim 12, wherein:

said movable membrane receives pressure of said coil spring via a holder.

18. An ink supply unit according to Claim 12, wherein:

said casing includes a frame-like casing provided at its side surface with a window, and an air intercepting film sealing said window.

19. An ink supply unit according to Claim 12, wherein:

said ink storage chamber communicates with an ambient air via a capillary formed in said container.

20. An ink supply unit according to Claim 19, wherein:

said capillary includes a groove formed on an upper wall of said ink storage chamber, and an air intercepting film sealing said groove.

21. An ink supply unit according to Claim 19, wherein:

said capillary includes a groove formed on a side wall of said ink storage chamber, and an air intercepting film sealing said groove.

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22. An ink supply unit according to Claim 12, wherein:

said movable membrane includes a movable part made of soft material, and a fixing part made of hard material and fixed to an periphery of said movable part.

23. An ink supply unit according to Claim 22, wherein:

a supporting part is formed in an outer periphery of said movable part; and

said movable part is connected to said fixing part via said supporting part.

24. An ink supply unit according to Claim 12, wherein:

a movable part is provided to said movable membrane; and

a supporting part is formed in an outer periphery of said movable part.

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25. An ink supply unit according to Claim 12, 22 or 24, wherein:

said movable membrane is provided with a movable part; and

an annular bent part is formed in the vicinity of an outer periphery of said movable part.

26. An ink supply unit according to Claim 24, wherein:

said movable part is located approximately at a center in a thickness direction of said supporting part.

27. An ink supply unit according to Claim 22 or 24, wherein:

a central area of said movable part is offset from a peripheral area thereof.

28. An ink supply unit according to Claim 22, wherein:

said fixing part is formed, at its side to said valve seat, with a flange part; and

a position of said movable part in its thickness direction is regulated by said flange part.

29. An ink supply unit according to Claim 12, wherein:

a filter is arranged in an upstream side with respect to said differential pressure valve.

30. An ink supply unit according to Claim 12, wherein:

said coil spring is contacted with said movable membrane via a holder having an ink flow hole located to face an ink flow port of said movable membrane.

31. An ink supply unit according to Claim 12, wherein:

said valve seat is formed as a spherical surface protruded toward said movable membrane.

32. An ink supply unit according to Claim 12, wherein:

a protruded part is formed on a surface of said valve seat where it is contacted with said valve seat.

33. An ink supply unit according to Claim 12, wherein:

said valve seat is formed as a protruded part having a planar surface on a side toward said movable valve.

34. An ink supply unit according to Claim 12, wherein:

said movable valve includes a disc-like movable part made of soft high polymer material and provided at its outer periphery with a thick par, and an annular supporting part made of hard high polymer material and provided at its valve seat side with a flange part; and

said valve seat is formed as a protruded part defining a planar surface on a movable valve side and having a thickness approximately equal to that of said flange part.

35. An ink supply unit according to Claim 34, wherein:

said planar surface of said protruded part and said flange part are located on the same plane.

36. An ink supply unit according to Claim 12, wherein:

said differential pressure valve includes a disc-like movable membrane formed at its center with an ink flow port, a coil spring contacted with said movable membrane, and a valve seat formed as a protruded part defining a planar surface on a movable ~~membrane side~~ and ~~having an outer edge~~ located outside an outer

periphery of said coil spring.

37. An ink supply unit according to Claim 36, wherein:

said movable membrane is formed at its valve seat side with a planar surface and at the opposite surface with a protruded part that supports said coil spring.

38. An ink supply unit according to Claim 12, wherein:

an ink injection port is provided to an upper surface of said container, and communicated with a bottom part of said ink storage chamber via a passage isolated from said ink storage chamber.

39. An ink supply unit according to Claim 12, wherein:

an ink injection port is provided to an upper surface of said container, and communicated with a bottom part of said ink storage chamber in the vicinity of an upstream side of said differential pressure valve via a passage isolated from said ink storage chamber.

40. An ink supply unit according to Claim 12, wherein:

said ink storeroom and an area where said differential pressure valve is accommodated are separated by a wall provided at its bottom part with a communicating hole;

a plurality of electrodes for detecting an ink level are provided in said ink storage chamber; and

at least one of said electrodes is disposed above said communicating hole.

41. An ink supply unit according to Claim 12, wherein: said differential pressure valve includes a spherical movable membrane provided at its center with an ink flow port, a coil spring contacted with said movable membrane, and a valve seat having a spherical part protruded toward said movable membrane.

42. An ink supply unit according to Claim 41, wherein: said valve seat is formed on a wall forming said ink storage chamber.

43. An ink supply unit according to Claim 41, wherein: said movable membrane and said coil spring are attached to a wall forming said ink storage chamber by a valve fixing frame.

44. An ink supply unit according to Claim 43, wherein: said valve fixing frame is formed with a passage communicating with a recording head.

45. An ink supply unit according to Claim 44, wherein: said passage includes a groove in said valve fixing frame, and an air intercepting film sealing said groove.

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46. An ink supply unit according to Claim 19, wherein: a film member having both gas permeability and repellent property is interposed between said capillary and said ink storage chamber.

47. An ink supply unit according to Claim 12, wherein: ink level detecting means is arranged in an upstream side

with respect to said differential pressure valve.

48. An ink supply unit according to Claim 29, wherein:

ink level detecting means is arranged in an upstream side with respect to said filter.

49. An ink supply unit according to Claim 29, wherein:

ink level detecting means is arranged so that said filter is not exposed when an ink end is detected.

50. An ink-jet recording device comprising an ink-jet recording head provided to a carriage, ink supply means, mounted to said carriage, for supplying ink to said recording head, and ink supplementing means for supplementing ink to said ink supply means, wherein:

said ink supply means is partitioned into an ink storage chamber and a valve chamber by a wall provided at its bottom part with an ink inflow port;

an ink injection port and an air open port connectable to an exterior are provided to said ink storage chamber;

a differential pressure valve opened when pressure in a recording head side is decreased is accommodated in said valve chamber;

said supplementing means is formed as negative pressure generating means for supplying negative pressure to said air open port; and

~~negative pressure in said ink supplementing means acts~~

on said ink storage chamber to cause ink to flow from said ink cartridge to the bottom part of said ink storage chamber when ink is supplied to said ink supply means.

51. An ink-jet recording device according to Claim 50, wherein:

said ink storage chamber is formed with an ink passage that has one end connected to said ink inlet and the other end extended to the bottom part of said ink storage chamber, and that defines such a gap to said ink inflow port to allow air bubbles in inflowing ink to rise by buoyancy and escape said ink inflow port.

52. An ink-jet recording device according to Claim 50, wherein:

capping means sealing said recording head and receiving negative pressure from a suction pump is provided; and

negative pressure is applied to said recording head via said capping means with said ink injection port and said air open port sealed so that ink in said ink storage chamber is degassed.

53. An ink-jet recording device according to Claim 50, wherein:

capping means sealing said recording head and receiving negative pressure from a suction pump is provided;

negative pressure is applied to said recording head via said capping means in a state in which said ink injection port

and said ink cartridge are connected and said air open port is sealed so that ink in said valve chamber is replaced while discharging ink from said recording head.

54. An ink-jet recording device comprising an ink-jet recording head provided to a carriage, ink supply means, mounted on said carriage, for supplying ink to said recording head, ink supplementing means for supplementing ink to said ink supply means, and capping means sealing said recording head and receiving negative pressure from a suction pump, wherein:

said ink supply means is partitioned by a wall provided at its bottom part with an ink inflow port into an ink storage chamber and a valve chamber that accommodates a differential pressure valve opened when pressure in a recording head side is decreased;

said ink supply means is provided with an ink injection port communicating with the bottom part of said ink storage chamber in the vicinity of an upstream side of said differential pressure valve via a passage isolated from said ink storage chamber; and

negative pressure is applied to said recording head via said capping means in a state in which said ink injection port is connected to an ink cartridge accommodating degassed ink so that ink in said valve chamber is replaced with degassed ink while discharging ink from said recording head.

55. An ink-jet recording device comprising an

ink-jet recording head provided to a carriage, ink supply means, mounted on said carriage, for supplying ink to said recording head, and an ink tank for supplying ink to said ink supply means, wherein:

said ink supply means accommodates an ink storage chamber, an air communicating hole communicating said ink storage chamber with an ambient air, and a differential pressure valve opened when pressure on a recording head side is decreased; and

said ink tank communicates with the ambient air via said air communicating hole provided to said ink supply means.

56. An ink-jet recording device according to Claim 55, wherein:

said ink tank is provided with plural ink chambers; and

said ink tank is adapted to supply ink to said ink supply means sequentially from one of said ink chambers to another.

57. An ink-jet recording device according to Claim 55, wherein:

a space within each ink chamber, from which ink has been supplied to said ink supply means, communicates with the ambinet air via said communicating hole.

58. An ink tank unit for an ink jet recording apparatus, comprising:

a container defining an ink chamber for accumulating ink therein, and an ink supply passage to be communicated with a recording head; and

a negative pressure generating mechanism selectively communicating said ink chamber with said ink supply passage depending on pressure change caused in said ink supply passage due to ejection of ink from the recording head, said mechanism including:

a stationary valve part;

a movable valve part having an elastically deformable membrane having a through hole; and

a biasing spring by which said stationary valve part and said movable valve part are biased against each other to normally close said through hole, said biasing spring permitting selective separation of said movable valve part from said stationary valve part to open said through hole and communicate said ink chamber with said ink supply passage through said through hole depending on said pressure change.

59. An ink tank unit for an ink jet recording apparatus, comprising:

a container having a partition wall that defines and separates first and second ink accumulating chambers, said partition wall having a first ink passage;

an elastically deformable first valve part opposite from said first ink accumulating chamber with respect to said partition wall, and defining a third ink accumulating chamber between said first valve part and said partition wall and within said second

ink accumulating chamber, said first valve part having a second ink passage that is opened to said third ink accumulating chamber at a first location offset from a second location where said first ink passage is opened to said third ink accumulating chamber;

a stationary, rigid second valve part provided to said partition wall and aligned with said first location,

wherein said first and second valve parts cooperatively opens and closes said second ink passage by contact with each other with the aid of a spring biasing said elastically deformable first valve part to said stationary, rigid second valve part, thereby selectively communicating first, second and third chambers together through said first and second passages.

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